SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-43

Name: West Oakwood Lake **County**: Brookings
Legal Description: T111N- R51W-Sec. 1, 3, 5-8, 12, 32, 36
Location from nearest town: 5 miles west of Bruce, SD.

Dates of present survey: July 27-29, 2010
Date last surveyed: July 28-30, 2008

Managed Species	Other Species
Walleye	White Sucker
Yellow Perch	Yellow Bullhead
Carp	Orange-spotted Sunfish
Black Bullhead	
Northern Pike	
Bigmouth Buffalo	

PHYSICAL DATA

Surface Area: 1,200 acres
Maximum depth: 10 feet
Volume: No data
Contour map available: Yes
OHWM elevation: 1626.9
Outlet elevation: 1626.4
Watershed: 43,363 acres
Mean depth: 6 feet
Shoreline length: No data
Date mapped: 1964
Date set: October, 1981
Date set: October, 1981
Lake elevation observed during the survey: 0.5 feet low
Beneficial use classifications: (5) warmwater semi-permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Introduction

The Oakwood Lakes complex derived its name from the numerous oak trees found in the area. East Oakwood Lake was originally named Oakwood Lake while West Oakwood was originally known as Lake Tetonkaha.

Ownership of Lake and Adjacent Lakeshore Property

West Oakwood is listed as a meandered lake in the State of South Dakota Listing of Meandered Lakes and the South Dakota Department of Game, Fish and Parks (GFP) manages the fishery. Much of the north and east shoreline is owned and managed by GFP as a Game Production Area and the Oakwood Lake State Recreation Area. The remainder of the shoreline is privately owned.

Fishing Access

Oakwood Lake State Recreation Area contains a two-lane boat ramp, dock, parking lot, public toilets, modern campground, and a handicapped-accessible fishing dock. Shore fishing sites are easily found throughout the area.

Field Observations of Water Quality and Aquatic Vegetation

The Secchi depth measurement was 71 cm (28 in) during the survey. Scattered stands of common cattail (*Typha spp.*) and bulrush (*Scirpus spp.*) were observed around the lake.

Winterkill History

1977-1978	Severe winterkill
1980	Aeration system installed by Oakwood Lakes Association
1981-1982	Poor oxygen levels recorded but no winterkill occurred
1990-1994	Somewhere in this time period a partial winterkill occurred
1996-1997	Severe winterkill
2000-2001	Severe winterkill
2009-2010	Severe winterkill: Carcasses were predominately common carp, buffalo and large walleyes.

BIOLOGICAL DATA

Methods:

West Oakwood Lake was sampled on July 27-29, 2010 with three overnight gill net sets and 10 overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting. Gill-net and trap-net sites are displayed in Figure 4.

Results and Discussion:

Gill Net Catch

Walleye (45.2%) and yellow perch (42.0%) were the most abundant species sampled in the gill nets (Table 1). Lesser numbers of white sucker, black bullhead, and common carp were also caught. Most of the walleyes and about half of the perch were age-0 (substock) fish (Table 2).

Table 1. Total catch from three overnight gill net sets at West Oakwood Lake, Brookings County, July 27-29, 2010.

Species	Number	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Walleye	247	45.2	82.3	±19.5	22.3	100	2	98
Yellow Perch	230	42.0	76.7	±18.6	52.7	26	6	102
White Sucker	30	5.5	10.0	±10.9	7.4	33	21	102
Black Bullhead	25	4.6	8.3	±7.6	79.1	4	0	94
Common Carp	15	2.7	5.0	±1.3	16.1	0	0	--

* 5 years (2000, 2002, 2004, 2006, 2008)

Table 2. Catch per unit effort by length category for various fish species captured with gill nets in West Oakwood Lake July 27-29, 2010.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Walleye	66.0	16.3	--	16.0	0.3	82.3	±19.5
Yellow Perch	37.3	39.3	29.0	8.0	2.3	76.7	±18.6
White Sucker	2.0	8.0	5.3	1.0	1.7	10.0	±10.9
Black Bullhead	0.3	8.0	7.7	0.3	--	8.3	±7.6
Common Carp	5.0	--	--	--	--	5.0	±1.3

Length categories can be found in Appendix A.

Trap Net Catch

Black bullheads (38.0%) and yellow perch (25.4%) were the most abundant species sampled in the trap nets (Table 3). The remainder of the catch consisted of bigmouth buffalo, common carp, walleye, northern pike, and white sucker.

Table 3. Total catch from 10 overnight trap net sets at West Oakwood Lake, Brookings County, July 27-29, 2010.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	106	38.0	10.6	±4.7	789.6	7	0	96
Yellow Perch	71	25.4	7.1	±3.0	3.6	23	10	101
Bigmouth Buffalo	41	14.7	4.1	±1.9	2.4	34	20	92
Common Carp	41	14.7	4.1	±1.7	12.5	89	78	101
Walleye	14	5.0	1.4	±0.9	5.4	100	7	92
Northern Pike	5	1.8	0.5	±0.4	0.8	--	--	--
White Sucker	1	0.4	0.1	±0.1	6.3	--	--	--

* 5 years (2000, 2002, 2004, 2006, 2008)

[1] See Appendix A for definitions of CPUE, PSD, and mean Wr.

Table 4. Catch per unit effort by length category for various fish species captured with trap nets in West Oakwood Lake July 27-29, 2010.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Black Bullhead	0.5	10.1	9.4	0.7	--	10.6	±4.7
Yellow Perch	0.1	7.0	5.4	0.9	0.7	7.1	±3.0
Bigmouth Buffalo	--	4.1	2.7	0.6	0.8	4.1	±1.9
Common Carp	3.2	0.9	0.1	0.1	0.7	4.1	±1.7
Walleye	--	1.4	--	1.3	0.1	1.4	±0.9
Northern Pike	--	0.5	0.2	0.3	--	0.5	±0.4
White Sucker	--	0.1	--	--	0.1	0.1	±0.1

Length categories can be found in Appendix A.

Walleye

Management objective: To maintain a walleye population with a gill-net CPUE of at least 15, 25 cm (10 in) or longer fish in three out of five lake surveys.

Over 80% of the walleyes sampled this year were age-0 fish that were 10-15 cm (4-6 in) long (Figure 1) and likely stocked as fry in May 2010. CPUE for age-1+ fish was about 16 and these fish were 38-44 cm (15-17 in) long. The establishment of a consistent, high-quality walleye fishery in West Oakwood is a challenge due to frequent partial and severe winterkills.

Table 5. Walleye gill-net CPUE, PSD, RSD-P and mean Wr for West Oakwood Lake, Brookings County, 2001-2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CPUE		5.0		9.0		62.0		22.3		82.3
PSD		0		100		29		17		100
RSD-P		0		0		0		0		2
Mean Wr		102		91		95		90		98

Yellow Perch

Management objective: To maintain a yellow perch population with a gill-net CPUE of at least 25, 13 cm (5 in) or longer fish in three out of five lake surveys.

Yellow perch gill-net CPUE tripled from the preceding survey (Table 6). The wide range in lengths of fish sampled (90-270 mm or 3.5-10.6 in) indicate relatively consistent natural reproduction and recruitment (Figure 2). It appears that perch of all sizes survived the 2009-2010 winterkill and that another natural year class was produced in 2010.

Table 6. Yellow perch gill-net CPUE, PSD, and mean Wr for West Oakwood Lake, Brookings County, 2001-2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CPUE		75.0		70.5		82.0		25.3		76.7
PSD		6		38		45		57		26
RSD-P		1		34		3		9		6
Mean Wr		108		95		97		104		102

Black Bullhead

Management objective: To maintain a black bullhead population with a trap-net CPUE of less than 100, 15 cm (6 in) or longer fish in three out of five lake surveys.

Black bullhead trap net CPUE has been slowly decreasing since 2002 and is now at the lowest level since 2001 (Table 7). Winterkills, failed natural reproduction, and high walleye abundance probably contributed to the decreased CPUE (Table 7). West Oakwood bullheads seldom exceed 25 cm (10 in) in length (Figure 3).

Table 7. Black bullhead trap-net CPUE, PSD and RSD-P for West Oakwood Lake, Brookings County, 2001-2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CPUE		1170.0		935.3		300.4		196.7		10.6
PSD		54		1		27		6		7
RSD-P		0		0		0		0		0
Mean Wr				75		97		83		96
Ave. TL				184		179		159		189

All Species

Numbers of adult common carp and black bullhead are below long term averages (Table 6). Most of the common carp sampled this year were age-0 fish. Other species sampled are within previously observed ranges.

Table 8. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in West Oakwood Lake, Brookings County, 2002-2010.

Species	2002	2003	2004	2005	2006	2007	2008	2009	2010
COC (GN)	36.7		15.0		10.0		8.3		5.0
COC (TN)	24.9		9.6		13.8		3.8		4.1
WHS (GN)	10.0		7.0		5.5		11.3		10.0
WHS (TN)	11.5		10.8		2.8		2.4		0.1
BIB (GN)	0.3		1.0		1.5		6.0		--
BIB (TN)	0.4		3.5		1.6		3.1		4.1
BLB (GN)	72.0		159.5		24.0		3.3		8.3
BLB (TN)	1,170.0		935.3		300.4		196.7		10.6
YEB (GN)	--		--		--		--		--
YEB (TN)	--		0.2		--		0.2		--
NOP (GN)	2.0		4.5		2.5		0.7		--
NOP (TN)	1.5		0.7		0.4		0.4		0.5
WHB (GN)	--		--		--		--		--
WHB (TN)	--		0.1		--		--		--
OSF (GN)	--		0.5		--		--		--
OSF (TN)	--		--		--		--		--
YEP (GN)	75.0		70.5		82.0		25.3		76.7
YEP (TN)	0.1		4.4		10.7		2.3		7.1
WAE (GN)	8.3		9.0		62.0		22.3		82.3
WAE (TN)	0.3		7.6		13.5		1.8		1.4

COC (Common Carp), WHS (White Sucker), BIB (Bigmouth Buffalo), BLB (Black Bullhead), YEB (Yellow Bullhead), NOP (Northern Pike), WHB (White Bass), OSF (Orange-spotted Sunfish), YEP (Yellow Perch), WAE (Walleye).

MANAGEMENT RECOMMENDATIONS

1. Stock walleye fry or fingerlings after winterkills to reestablish the population and as needed to accomplish the management objective.

2. Stock yellow perch fry, fingerlings or adults after a winterkill to reestablish the population and as needed to accomplish the management objective.

3. Accomplish the black bullhead management objective by maintaining walleye abundance.

4. Monitor the West Oakwood fishery by continuing to conduct lake surveys every other year.

Table 9. Stocking record for West Oakwood Lake, Brookings County, 1990-2010.

Year	Number	Species	Size
1990	38,016	Yellow Perch	Fingerling
1991	21,370	Yellow Perch	Fingerling
	2,030	Walleye	Lrg. Fingerling
	788	Walleye	Fingerling
1992	60,000	Northern Pike	Fingerling
	29,900	Largemouth Bass	Med. Fingerling
1993	1,200,000	Walleye	Fry
1994	132,700	Saugeye	Sml. Fingerling
	17,020	Yellow Perch	Juvenile
	4,082	Yellow Perch	Adult
1997	220,000	Walleye	Fingerling
1999	1,200,000	Walleye	Fry
2001	79,300	Walleye	Fingerling
	12,221	Yellow Perch	Adult
2004	119,100	Walleye	Fingerling
2006	1,201,589	Walleye	Fry
2010	1,200,000	Walleye	Fry

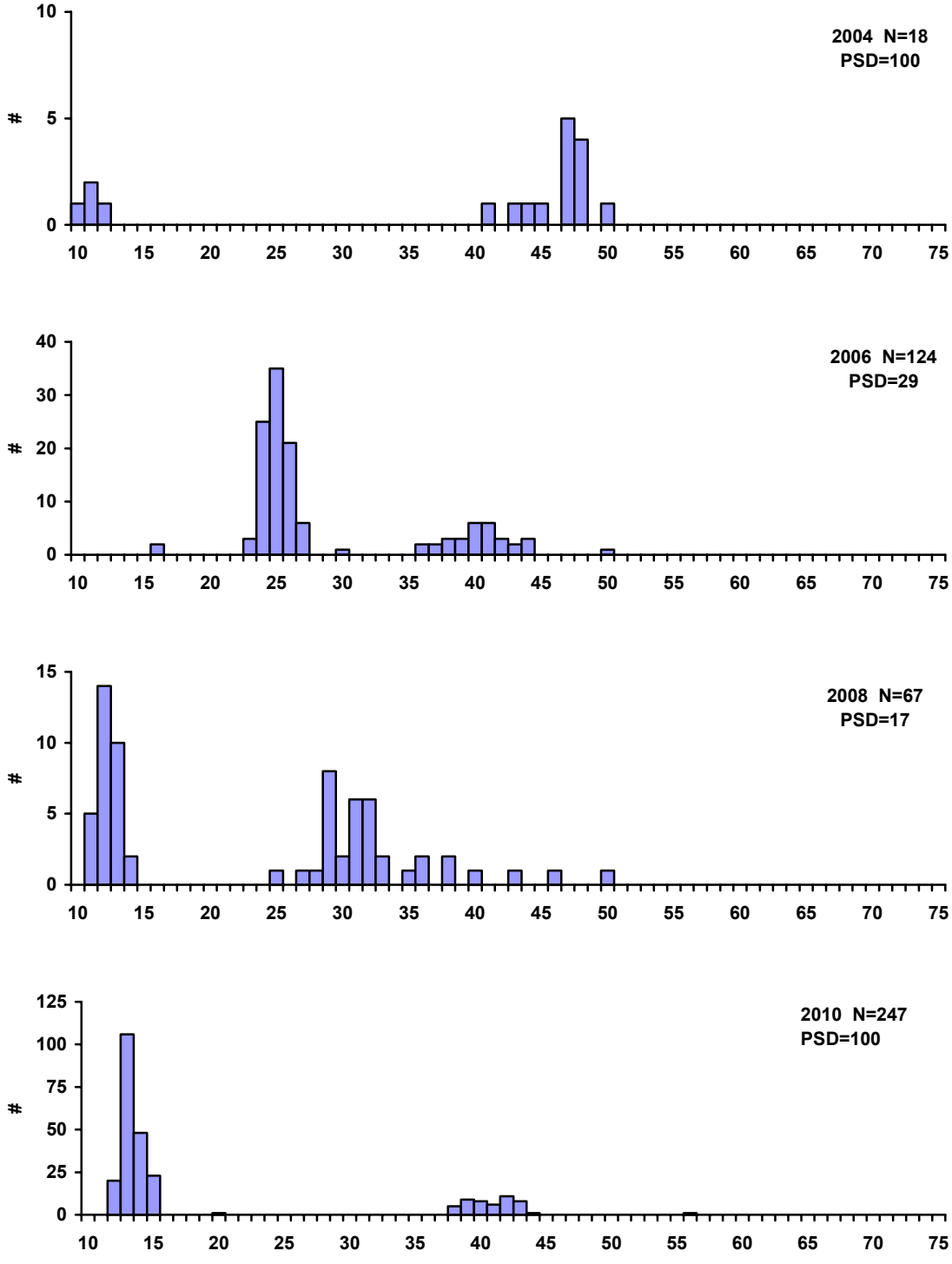

Figure 1. Length frequency histograms for walleyes sampled with gill nets in West Oakwood Lake, Brookings County, 2004, 2006, 2008, and 2010.

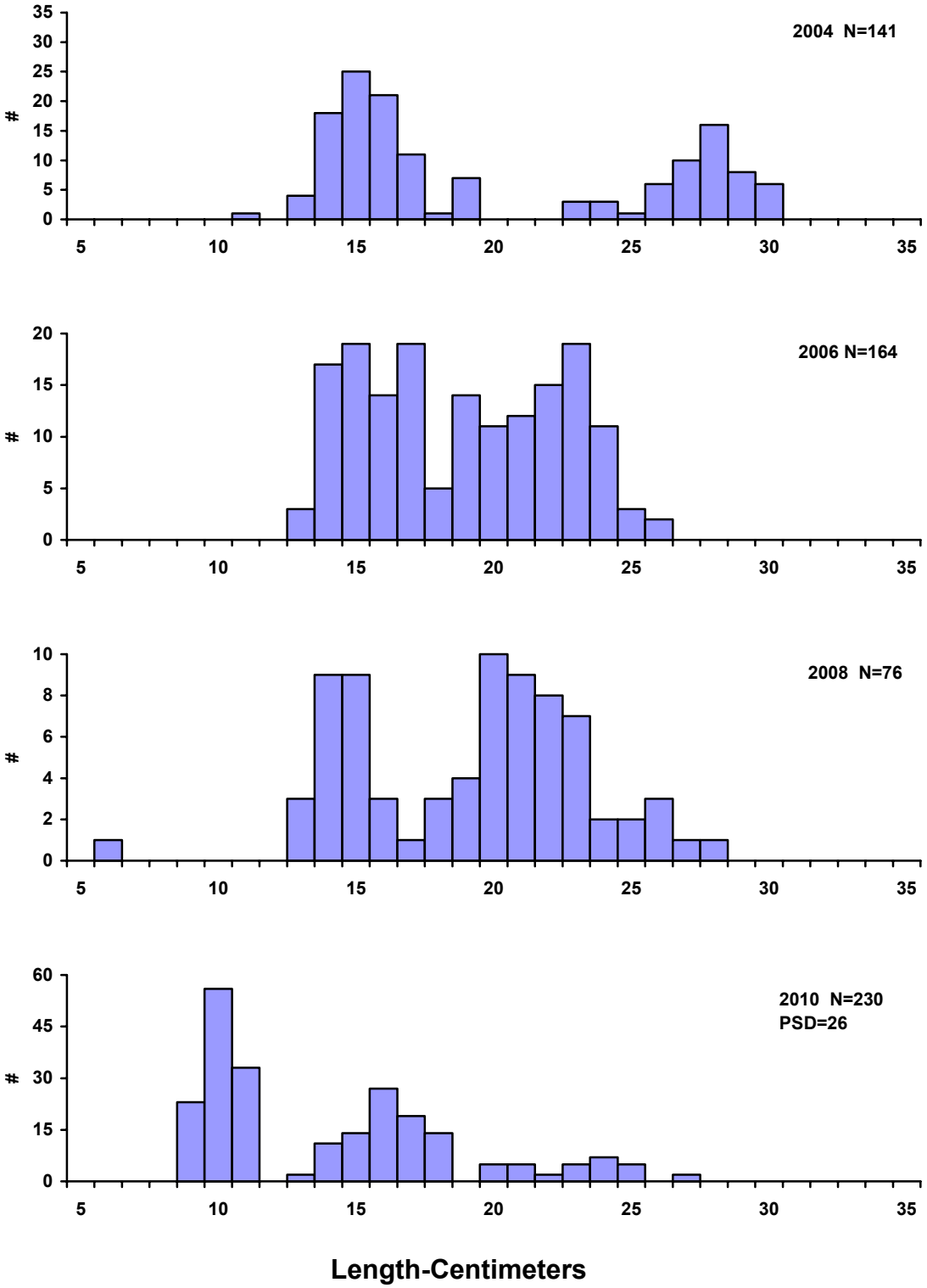

Figure 2. Length frequency histograms for yellow perch sampled with gill nets in West Oakwood Lake, Brookings County, 2004, 2006, 2008, and 2010.

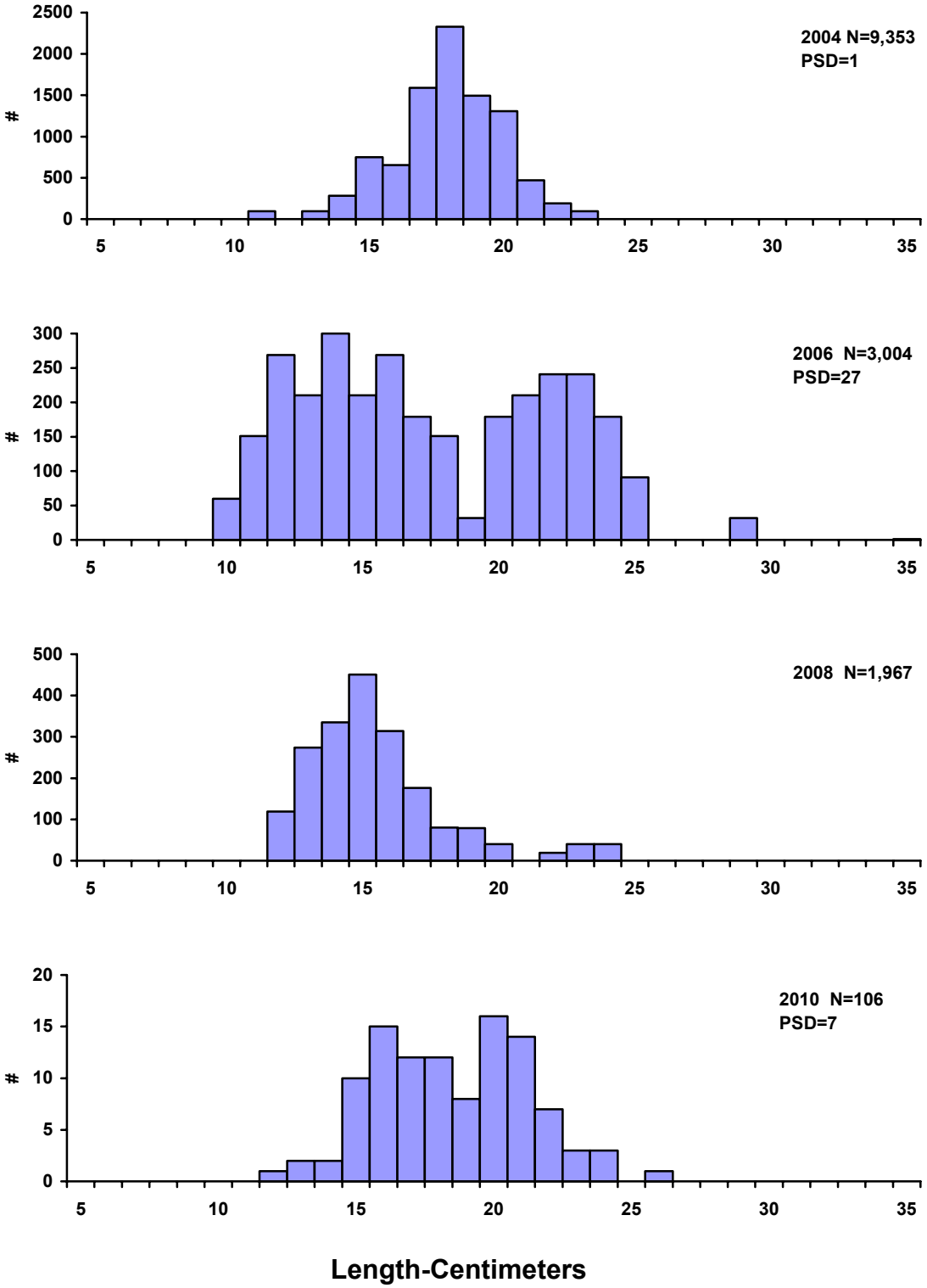

Figure 3. Length frequency histograms for black bullheads sampled with trap nets in West Oakwood Lake, Brookings County, 2004, 2006, 2008, and 2010.

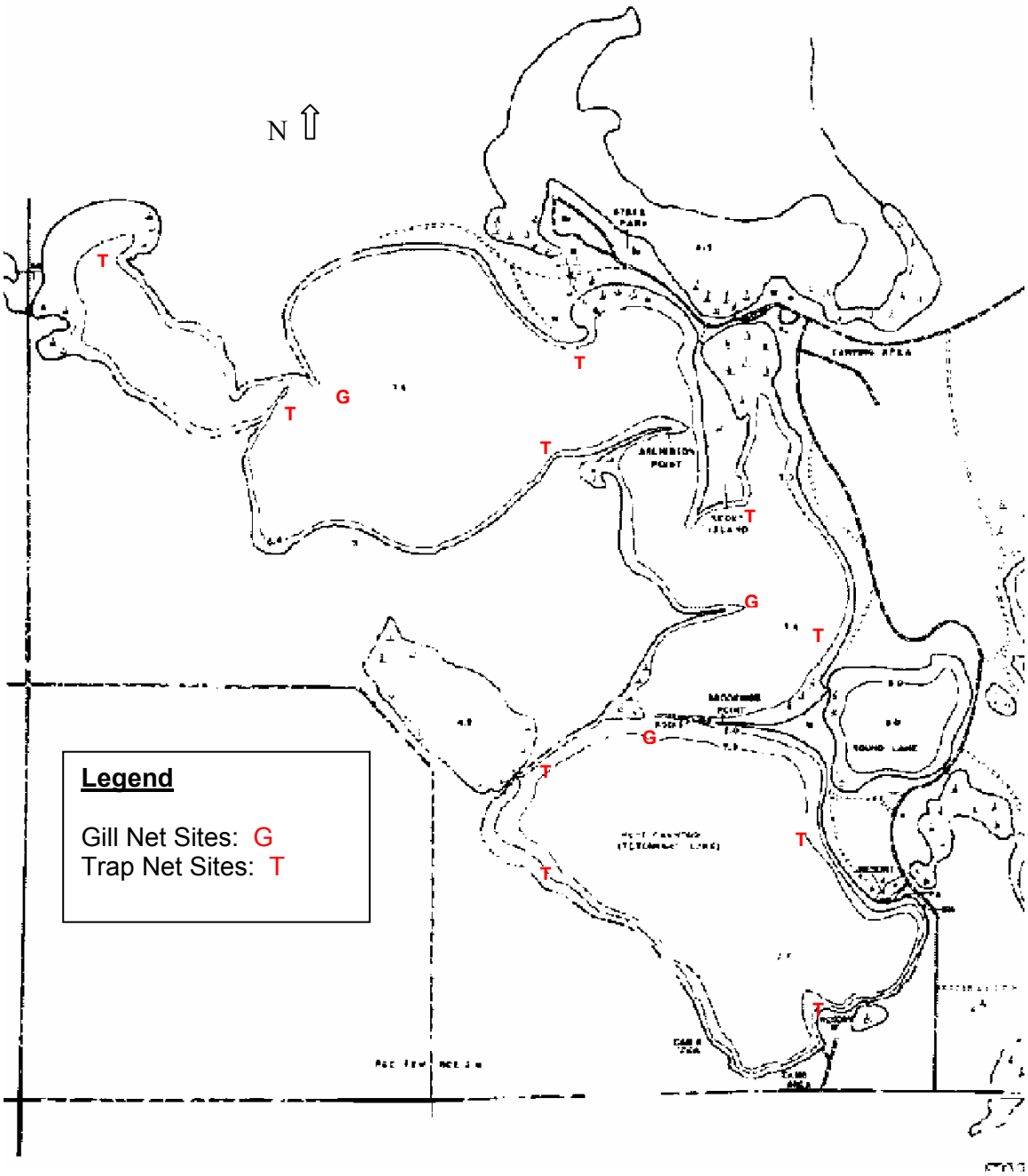

Figure 4. Sampling locations on West Oakwood Lake, Brookings County, 2010.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters (inches in parenthesis).

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25 (10)	38 (15)	51 (20)	63 (25)	76 (30)
Yellow perch	13 (5)	20 (8)	25 (10)	30 (12)	38 (15)
Black crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
White crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
Bluegill	8 (3)	15 (6)	20 (8)	25 (10)	30 (12)
Largemouth bass	20 (8)	30 (12)	38 (15)	51 (20)	63 (25)
Smallmouth bass	18 (7)	28 (11)	35(14)	43 (17)	51 (20)
Northern pike	35 (14)	53 (21)	71 (28)	86 (34)	112 (44)
Channel catfish	28 (11)	41 (16)	61 (24)	71 (28)	91 (36)
Black bullhead	15 (6)	23 (9)	30 (12)	38 (15)	46 (18)
Common carp	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)
Bigmouth buffalo	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.